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Cytogenetic Analysis of Two Indian Cat Fishes of Genus Mystus (Bagridae, Siluriformes), Species Becoming Endangered

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Abstract: Nucleolus organizer regions (NORs) were studied in the mitotic chromosomes of two species of family Bagridae *M. bleekeri* and *M. vittatus*. Male and female individuals of both species were obtained from nature. A karyotype structure consisting of 56 chromosomes distributed as 18 metacentrics, 2 submetacentrics, 8 subtelocentrics, and 28 telocentric was observed in *M. bleekeri*. While, the karyotype of *M. vittatus* showed 54 chromosomes distributed as 28 metacentrics, 12 submetacentrics, 6 subtelocentrics, and 8 telocentrics. The nucleolus organizer regions were identified on submetacentric chromosomes. The size of the NORs on both homologous pairs is the same.

Keywords: *Mystus*, NORs & Chromosomes

Introduction: Genus *Mystus* belongs to family bagridae. thirteen species of this genus have so far been worked out cytogenetically (Yeesin, P *et.al*. (2021). But noticeable differences have been observed in the data pertaining to the same species. Presently two species of this genus, *Mystus bleekeri* and *Mystus vittatus* have been analyzed for the study of conventional karyotype and localization of NORs, which have become almost endangered in many fresh water bodies. The visualization of nucleolar organizer regions (NORs) in the chromosome is an important parameter adding to the structural details of the karyotypes. The morphology of NOR bearing chromosomes and the position of the NORs on the chromosomes seems to be species specific. Therefore, NORs can serve as an important aid for species differentiation and thus for problem of systematic classification, which is needed in case of genus *Mystus.* Moreover, variation in NORs within a species helps in studding the nature of NORs themselves (structure, function, and evolution of ribosomal genes) and genetic polymorphism.

Materials and Methods: Live specimens of both the species were collected from nature. *Mystus bleakeri* was captured from Satluj-Yamuna Link canal near Kurukshetra and *Mystus vittatus* was obtained from a village pond near Kurukshetra. Before dissection, live male and female specimens were kept in aquarium after injecting 0.001% colchicine solution for 2-3 hrs. Kidney and gill epithelium were used for the chromosomal preparations employing the standard hypotonic - acetic methanol - air drying technique (cf. Rishi, 1989). Slides were stained in 2%

Giemsa solution, suitable metaphases were photographed and karyotyped according to the classification of Levan et el. (1964). Method of Howell and Black (1980) was used silver staining of NORs.

Results: Majority of the somatic karyotype metaphase of *M. bleekeri* revealed 2n=56 in both male and female specimens. There karyotype comprised 18 metacentrics 02 submetacentrics and 28 telocentrics with FN=76. Ag-NOR staining for NOR-active sites have been successfully achieved (fig.1,2). NORs have been observed on the 3rd pair in both the sexes (fig.3,4). The size of NORs on both the homologous pair is the same.

Fig 1: Ag-stained metaphase chromosome plate of male *M. bleekeri*

Fig 2: Ag-stained metaphase chromosome plate of female *M. bleekeri*

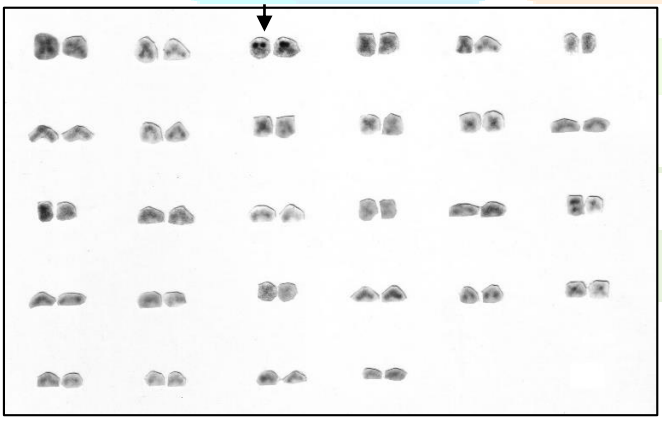

Fig 3: Karyotype of Ag-stained chromosomes of male *M. bleekeri*

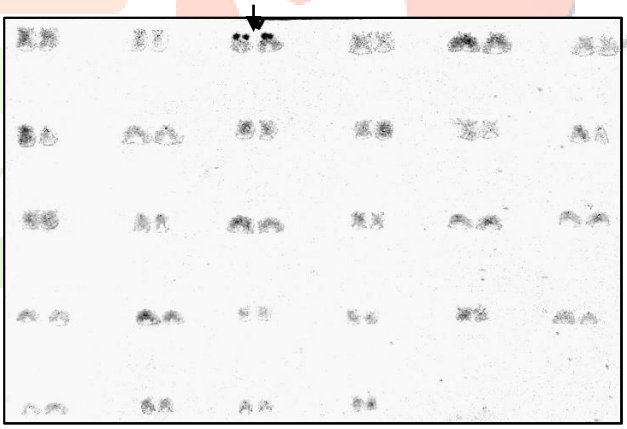

Fig 4: Karyotype of Ag-stained chromosomes of female *M. bleekeri*

The karyotype of *M. vittatus* showed 54 chromosomes distributed as 28 metacentrics, 12 submetacentrics, 3rd subtelocentrics, and 8 telocentrics with FN= 94. The NOR's were found to be localized on 8th acrocentric pair in both the sexes (fig 5,6,7). NORs on both the homologous are of similar size and densely stained. No sex chromosomes were distinguished even by differential staining.

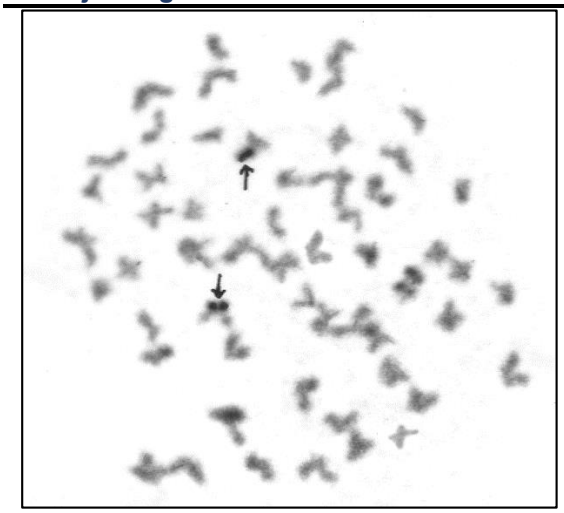

Fig 5: Ag-stained metaphase chromosome plate of male *M. vittatus*

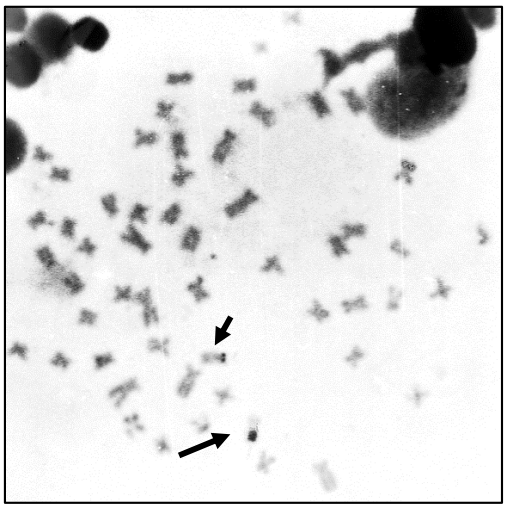

Fig 6: Ag-stained metaphase chromosome plate of female *M. vittatus*

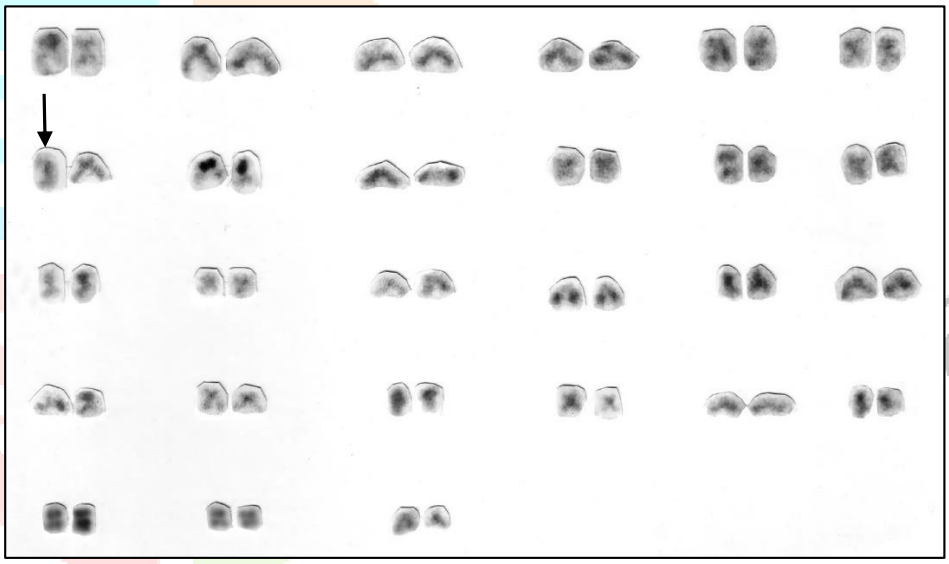

Fig 7: Karyotype of Ag-stained chromosomes *M. vittatus*

Discussion: thirteen species of genus *Mystus* have been worked out by various workers (Barat and Khuda Bukhsh, 1986; Hong and Zhou, 1984; Khuda Bukhsh et el., 1978; Magtoon and Arai, 1988; Manna and Khuda Bukhsh, 1978; Manna and Prasad, 1974; ; Rishi, 1973; Sharma and Tripathi, 1986; Tripathi and Das, 1980; Thind, 2022.). Documented data show a range of diploid number of chromosomes 2n=54 to 2n=60 in this genus. The diploid number 2n=56 for M. *bleekeri* and 54 for *M. Vittatus* found during present investigations fit very well in to the general scheme of karyotypes of genus *Mystus* suggested by various workers. Previous data also revealed the range of FN values 84 to 102. Presently worked out fish *M. bleekeri* and *M. vittatus* show the FN value of 76 and 94 respectively.

The members of genus *Mystus* show a much greater range of variation in the FN values than in the Diploid numbers. Therefore, the role of pericentric inversion become quite clear in the evolution of genus *Mystus*. In general, fishes have shown only one pair of homologous chromosomes carrying the NORs restricted to the telomeric area. This usual condition has been considered as fundamental and original in fishes by Takai and Ojima (1986). Thode (1987) considered the fishes bearing only one pair of NORs as of ancestral status. The presently worked out fish

species have revealed usual location of NORs on 3rd subtelocentric pair in *M. bleekeri* and 8th telocentric pair in *M. vittatus*. Therefore, both the fish species might have the ancestral status in the course of evolution.

Conclusion: Available literature revealed that the number of NORs, the morphology of NOR bearing chromosomes, and the position of the NORs on the chromosomes showed marked diversity. Closely related species with very similar karyotypes also may show different NOR sites. Therefore, it is quite clear that NORs can serve as an important aid for species differentiation and thus for problems of systematic classification.

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